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# Triassic Sedimentary Rocks of Central Connecticut; their Petrology, Petrography, Stratigraphy and Structure

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## General remarks

Stratigraphy.-- The mapping subdivisions of the Connecticut Triassic are as follows:

Newark group
- Portland arkose (Upper or Eastern sandstones)
- Meriden formation
  - Hampden basalt member (Third, Upper, or Posterior lava flow)
  - Upper sedimentary member (Posterior or Middle shales)
  - Holyoke basalt member (Second, Middle, or Main lava flow)
  - Lower sedimentary member (Anterior sandstones and shales)
  - Talcott basalt member (First, Lower, or Anterior lava flow)
- New Haven arkose (Under or Western sandstones).

In addition, there are intrusive masses, mainly sills, of dolerite.

The stratigraphy and sedimentary petrography of the Newark group in central and southern Connecticut has recently been described by Krynine (1950).

Structure.-- In most of the Triassic area the beds strike near north and dip east at angles near 15 degrees. Hence the oldest rocks crop out to the west, the youngest to the east. The western boundary is in part an unconformity, in part a normal fault of no very great throw, probably a few hundred feet. It is described by Wheeler (1937). The eastern boundary is a normal fault of very great throw, not less than 16,000 feet and perhaps much more. The presence of fanglomerate in each of the subdivisions of the Newark group where they approach this fault shows that it was active during Triassic deposition. Between these two boundaries, the Triassic rocks of the Hartford-Meriden area are cut by a number of other normal faults, most or all downthrown to the west and hence repeating the east-dipping beds at the surface. The largest of these faults passes through Meriden between the Hanging Hills and Lamentation Mountain; it has a throw of several thousand feet. West of it, in the Hanging Hills, the Triassic rocks strike nearly east-west and dip north. Other exceptions to the general rule of east dip are found mainly close to the eastern boundary fault in southern Connecticut.

Bibliography.-- The references cited in this guide are:

Digman, Ralph, 1950, An exposure of the Triassic eastern border fault in Connecticut: Am. Jour. Sci., v. 248, p. 37-45.

Krynine, P. D., 1950, Petrology, stratigraphy, and origin of the Triassic sedimentary rocks of Connecticut: Connecticut Geol. Nat. History Survey Bull. 73.

Wheeler, Girard, 1937, The west wall of the New England Triassic lowland: Connecticut Geol. Nat. History Survey Bull. 58.

## Itinerary

0.0 Summit Street, Hartford, just west of Geology Building of Trinity College (Hartford South quadrangle).
Proceed south on Summit Street, which follows summit of ridge underlain by 3rd (Hampton) lava flow in Meriden formation.

0.3 Gate of Trinity Campus. TURN RIGHT on New Britain Avenue, U. S. Highway 6. (We follow Highway 6 for 14 miles.)

0.4 Road drops down scarp face of ridge underlain by 3rd flow.

1.1 Intersection with White St. BEAR RIGHT on New Britain Avenue.

1.3 - 1.4 Outcrop of 2nd (Holyoke) lava flow on left. This outcrop belt of the 2nd flow is cut off here by a diagonal fault (the same fault that cuts off the 3rd flow north of the Trinity Campus). Beyond the fault we are over the Portland formation, above the 3rd flow.

1.9 Enter town of West Hartford.

2.4 Underpass beneath main Connecticut Valley line of New Haven Railroad.

3.5 Ridge underlain by 3rd lava flow.

3.9 Enter New Britain quadrangle.

4.4 Outcrop of 3rd lava flow, repeated by faulting.

4.4 - 4.5 Traffic circle. Take FIRST RIGHT on Colt Highway, following U. S. 6.

4.6 Enter town of Farmington. Outcrop of 3rd lava flow, repeated again by faulting.

4.9 - 5.0 More outcrops of 3rd lava flow.

7.4 - 8.4 Scattered outcrops of top of 2nd lava flow.

8.5 - 8.7 Road cuts through Farmington Mountain, upheld by 2nd lava flow. Quarry to left.

9.0 - 9.3 Road cuts through 1st (Talcott) lava flow.

9.7 Road crosses State Highway 10 (College Highway). From this point for 5 miles, the road crosses the outcrop belt of the New Haven arkose, the lowest formation of the Newark group of Connecticut, but it is completely covered with glacial drift. A mile north of the road is the curious elbow of the Farmington River, which after flowing southeast out of the Highlands here turns abruptly north for 13 miles before breaking through the mountain underlain by the 2nd flow. The River may originally have proceeded southeast through Cooks Gap, two miles south of the road.

10.3 Cross Pequabuck River and ascend glacial river-terrace beyond. Continue on U. S. 6 which is now Scott Swamp Road.

11.6 Enter Bristol quadrangle.

12.9 Enter town of Bristol. Road becomes Farmington Avenue.

14.5 We are approaching the front of the Western Highlands, here formed by the Hartland schist. The front of the Highlands is a fault here, as shown beyond (16.3).

14.7 TURN LEFT on King Street.

15.2 BEAR LEFT on level on King Street.

15.3 - 15.4 Outcrops of silicified Triassic conglomerate, showing slickensides on east-dipping fractures. Locality 13 of Wheeler (1937).

16.1 Outcrop of silicified Triassic conglomerate on right.

16.3 - 16.4 Go slow but do not stop. Drivers be ready for intersection.

Poor outcrops of silicified conglomerate on right are followed after short gap by large outcrop of Hartland mica schist. Fault must intervene, as schist makes hill rising 200 feet just to west. More outcrops of schist at road corners and in bed of Pequabuck River under bridge. Locality 12 of Wheeler (1937), 37 of Krynine (1950 ; see Bristol in index).

At junction with State Highway 72, BEAR RIGHT under railroad, then BEAR LEFT across Pequabuck River on Middle Street.

Locality 37a of Krynine (1950; see Forestville in index) is on south side of Route 72 1 mile east of intersection; here unusually carbonaceous sandstone, siltstone, and shale are found in the New Haven arkose, which rarely contains unoxidized material.

16.6 At school, BEAR RIGHT on Lake Avenue. The Highland front is conspicuous on the right.

18.5 Enter town of Southington. Lake Avenue becomes Mount Vernon Road and follows a crevasse filling beside Lake Compounce, which fills a kettle.

19.7 Enter Southington quadrangle.

21.0 STOP in front of house by bridge over Roaring Brook.
Walk a quarter of a mile up trail on north side of brook to narrow gorge. First outcrops show Triassic conglomerate; larger outcrops show Triassic resting unconformably upon Hartland mica schist and pegmatite. Locality 10 of Wheeler (1937), 39 of Krynine (1950; see Roaring Brook in index). Note however that the unconformity, projected upstream, will not pass over the steep hill to the west, which is schist to the top. Hence the fault present at Bristol (or a parallel fault) must pass between the brook locality and the hill; study of the new maps and airplane photographs shows that it continues south-southwest into the crystalline rocks and does not follow the Triassic border southward from here, as suggested by Wheeler.

Krynine's petrographic work has confirmed Barrell's conclusion that the Triassic material is <u>not</u> derived from the underlying schist to any considerable degree, but from the Eastern Highlands 15 miles to the east.

Proceed south on Mount Vernon Road. The Hanging Hills, conspicuous to the left, represent the south end of the monoclinal (though faulted) ridge extending south from Farmington Mountain (crossed at 8.6).

21.7 TURN LEFT on West Center Street. We now return across the outcrop belt of the New Haven arkose, which is as badly covered as before. We will see typical New Haven arkose later, at Hanover Pond.

23.3 Intersection with West Street. JOG RIGHT and proceed on West Center Street, crossing large drumlinoid hill.
Two to three miles to the north along West Street, on the southwest flank of Redstone Hill, is Locality 36 of Krynine (1950), the type locality for his redstone facies of the New Haven arkose.

24.0 - 24.1 Cross Quinnipiac River and railroad grade crossing.

24.2 TURN LEFT on Liberty Street.

24.35 TURN RIGHT on Center Street.

24.5 TURN LEFT on State Highway 10, the College Highway.

25.4 Enter Meriden ($7\frac{1}{2}$') quadrangle.

25.6 TURN RIGHT up hill on Flanders Street.

26.6 Hills ahead are over 1st lava flow.

27.2 TURN LEFT on Flanders Road.

27.5 Reenter New Britain quadrangle.

27.8 TURN RIGHT on Mine Hollow Road.

28.2 - 28.3 Outcrops of redstone at top of New Haven arkose on right. Locality 33 of Krynine (1950; see Shuttle Meadow Pass in index).

28.3 - 28.4 Outcrops of 1st lava flow (Talcott member of Meriden formation) on left.

28.5 TURN RIGHT. Watch for right angle turns. Shuttle Meadow Reservoir on left. Second lava flow makes hills beyond and dam at far end.

28.8 Top of 1st flow on right, then on left.

29.0 TURN LEFT at barn, then TURN LEFT at intersection, onto Andrews Street.

29.1 - 29.2 Outcrops; continue to

29.4 STOP in road metal pit at right. Shuttle Meadow Reservoir; Localities 29 & 30 of Krynine (1950; see S. M. R. in index). This is an excellent display of the rock types in the lower sedimentary member of the Meriden formation, and is the type locality for Krynine's lacustrine facies of the Meriden. Note especially the fine grain, the fine lamination, the green and black colors, and the layers of dolomitic siltstone.

Proceed northeast on Andrews Street.

29.8 - 30.4 Cliffs of the 2nd lava flow (Holyoke member of Meriden formation) on the right, also across the reservoir. Road climbs through flow.

30.5 Enter town of Berlin. Road proceeds for a mile down dip slope of the 2nd flow.

30.7 Road crosses deep ditch cut into 2nd flow.

30.8 Enter town of New Britain; road becomes Shuttle Meadow Avenue.

31.5 BEAR RIGHT on Shuttle Meadow Avenue.

31.8 Traffic light. TURN RIGHT on Corbin Avenue, State Highway 72.

32.3 Reenter town of Berlin; road becomes Farmington Avenue.

32.4 Intersection with State Highway 71-A; continue on Highway 72.
In next mile road crosses 3rd lava flow twice, but there are no obvious outcrops.

33.8 Center of Kensington; continue on Highway 72 under railroad (Conn. Valley line of New Haven RR.).

34.2 - 34.8 Old brick pits in Berlin Lake clay.

34.8 BEAR LEFT following Route 72.

35.0 Reenter Hartford South quadrangle.

35.4 Intersection; continue on Route 72 now, but note for future reference (37.5).

35.5 Cross over Cross Parkway. Enter Middletown ($7\frac{1}{2}$') quadrangle.

35.6 - 35.9 Pass outcrops; we are coming right back to them.

36.5 - 36.6 TURN LEFT on Berlin Street, then immediately TURN RIGHT on Buckly Road, then TURN RIGHT again on Route 72.

37.2 STOP, parking on right shoulder as far off road as possible. This is a busy road, so watch for the traffic.

Exposure of upper part of upper sedimentary member of Meriden formation, overlain by 3rd lava flow (Talcott member of Meriden formation). The sediments immediately beneath the flow are baked. Note the general fine grain of the sediments, the good bedding and lamination, the alternating layers of red and non-red. At one point, a layer of dark shale appears to have been strongly deformed; this is very exceptional for the Triassic. The non-red layers resemble Krynine's swamp facies of the Meriden (this cut was made after his work was finished).

Proceed back west on Highway 72.

37.4 Cross Cross Parkway; avoid clover leaf to left to New Haven, but

37.5 TURN LEFT on road marked Berlin; road is called Worthington Ridge.

38.3 Center of Berlin. Straight ahead, unless we are late for lunch.
(If time is short, we may omit the next stop and take a short cut here, as follows:
38.03 Turn right on Hudson Street.
38.45 Reenter Meriden quadrangle.
38.7 Stop sign. Continue straight ahead on Norton Road.
39.1 Outcrop of 3rd lava flow.
39.2 Cross roads. 40.6 of itinerary below. Straight ahead on Norton Road.

39.0 Reenter Meriden quadrangle.

39.1 TURN RIGHT on Peter Parley Row.

39.3 TURN LEFT on Lower Lane.

39.5 TURN RIGHT on Meadow Lane.

40.1 Beginning of outcrops.

40.3 STOP. Part of upper sedimentary member of Meriden formation, much like that at last stop. Locality 27 of Krynine (1950; see Kensington in index); this is the type locality for his swamp facies of the Meriden.

Proceed north on Four Rod Road.

40.5 Quarry to right in red siltstone and shale.

40.6 Cross-roads. TURN LEFT on Norton Road. Ridge ahead to right (before turning) is underlain by 3rd lava flow.

40.8 Cross railroad bridge (main Conn. Valley line of New Have RR.) and JOG RIGHT at intersection with Kensington Road; continue on Norton Road.

41.6 Third lava flow again, repeated by faulting.

42.1 - 42.2 Outcrops of upper sedimentary member of Meriden formation.

42.2 Stop sign. TURN LEFT on State Highway 71, Chamberlain Highway.
Mountain to left in distance is Lamentation Mountain, underlain by 2nd lava flow dipping east; it lies beyond a big fault, which we crossed and recrossed near the Cross Parkway. Mountain to right is monoclinal ridge extending south from Shuttle Meadow Reservoir, also underlain by 2nd lava flow dipping east.

43.3 Fine drumlins on both sides of road (or drumlinoids?; we don't know if they have rock cores).

43.5 Hanging Hills of Meriden ahead. These are underlain by 2nd lava flow dipping north and striking east-west between south end of monoclinal ridge south of Shuttle Meadow Reservoir and the big fault in front of Lamentation Mountain. These relations will be clearer from the top of the Hills.

44.7 Outcrop of 2nd lava flow in ridge to left, across small fault.

45.1 Leave highway, BEAR RIGHT on Butler Street.

45.2 TURN RIGHT on Park Drive.

45.2 - 45.4 Road crosses part of 2nd lava flow, then a fault dropping upper sedimentary member of Meriden formation down beside flow.

45.8 BEAR LEFT on Park Drive.

46.0 Top of 2nd flow. We remain on this dip slope to the top of the Hills.

46.2 Stop sign. TURN RIGHT on West Peak Road. Merimere Reservoir on left.

46.7 Start up fairly steep hill, rather bumpy pavement. Enter town of Meriden. Notice strong control of micro-topography by joints or faults, especially to left of road.

47.65 Forks. BEAR LEFT. Right fork goes to top of West Peak, which also has a fine view, mainly across toward the Western Highlands.

48.0 BEAR RIGHT into

48.1 East Peak parking lot. STOP. Lunch.
From this point the course of the 2nd lava flow through the zone of faults around Meriden can easily be seen. From the north (Farmington Mountain, Shuttle Meadow) it extends south, dipping east, to about West Peak (fire tower and television antenna), then east, dipping north, through East Peak and the hills next to the east, though broken by several faults, as at the Reservoir below us. Beyond these hills, it is offset about 4 miles to the northeast, to the north end of Lamentation Mountain, the northernmost of the prominent ridges beyond the city of Meriden. It then extends southward as before, but offset several times by additional faults. At the north end of the fourth segment of this chain is the large Reed Gap quarry, which will visit later in the day. Beyond these mountains underlain by the 2nd flow can be seen the Eastern Highlands. To the south, if the weather is clear, can be seen Mount Carmel, East Rock at New Haven, Long Island Sound, and Long Island. To the west is the lowland cut on the New Haven arkose and beyond it the Western Highlands. Beneath us is a prominent bench held up by the 1st lava flow. Under our feet, the top of the 2nd flow is cut by numerous northeast-trending joints, parallel to the faults that offset the ridges. These joints have produced the pronounced buttresses and recesses at the lip of the cliff.

Return down the mountain to the intersection of Park Drive and West Peak Road (46.2 on the way up).

50.0 TURN RIGHT on Park Drive.

50.2 - 50.5 Road descends through 2nd lava flow.

50.7 Outcrop of red shale, in lower sedimentary member of Meriden formation. Island in Reservoir may be a down-dropped block of lava. Across Reservoir note smooth joint face parallel to joints seen at East Peak.

50.8 Reenter town of Meriden.

50.9 - 51.2 Road crosses 1st lava flow. Quarry at 51.15 shows poor pillows, but much better ones can be seen under pavilion on the bench held up by the 1st flow, about a third of a mile to the west (must be reached by walking).

51.3 TURN LEFT up hill on Reservoir Avenue.

51.8 TURN RIGHT onto Sylvan Avenue.

52.1 Traffic light. Cross West Main Street and BEAR RIGHT on Johnson Avenue behind filling stations.

52.2 TURN LEFT on Allen Avenue.

52.5 TURN LEFT on Coe Avenue.

52.8 TURN RIGHT at foot of hill on Oregon Avenue.

53.8 STOP, park at left. Outcrops on right and across bridge over Quinnipiac River. This is an excellent exposure of the New Haven arkose. Locality 33a of Krynine (1950; see Hanover Pond in index); here his redstone facies and his arkose facies are interbedded. To the west the redstone facies predominates, to the east (within this formation) the arkose facies. The rocks here are cut by a number of faults, especially well displayed in the outcrops across the river; the locality must be very close to the big fault that offsets the 2nd lava flow from the Hanging Hills to Lamentation Mountain.

Proceed across bridge and
54.0 TURN LEFT on Cheshire Avenue, State Highway 70.

54.3 Blinker; TURN LEFT with Highway 70 onto Main Street.

54.9 Cross Quinnipiac River; at traffic light TURN RIGHT on State Highway 71.

55.7 Stop sign. TURN RIGHT on U. S. Highway 5A.

55.8 Enter town of Wallingford.

56.5 Enter Wallingford quadrangle (New Haven 15').

56.7 Stop sign and bad corner. Follow U. S. 5A. TURN LEFT through railroad underpass (Conn. Valley line for the last time), then (56.8) TURN RIGHT toward Wallingford.

57.1 Stop at blinker. KEEP RIGHT on U. S. Highway 5.

57.5 Pass under Cross Parkway.

57.9 TURN LEFT behind Barnes Nursery on Barnes Road.

58.1 Intersection with North Main Street. JOG RIGHT and continue on Barnes Road.

59.1 Sharp bends. Continue on Barnes Road.

59.3 Stop sign at North Farms Road. Continue on Barnes Road.

59.8 BEAR LEFT on Barnes Road.

60.1 BEAR RIGHT on Barnes Road.

60.7 BEAR LEFT.

61.0 - 61.3 Ridge on left, also ridge ahead, are underlain by 1st lava flow. Mountain behind ridge ahead is underlain by 2nd flow.

61.4 TURN LEFT on Durham Road. Reed Cap Quarry in 2nd flow ahead.

61.8 Enter Durham quadrangle (Guilford 15').

62.0 Bad curves and narrow bridge over railroad (Air Line to Middletown). TURN LEFT at far end of bridge.

62.4 TURN RIGHT on dirt road to quarry. Keep left at house, then as straight as possible and up hill to left between railroad cars, then sharp right onto quarry floor and on into south part of quarry (62.8).
In projecting buttress at southwest corner of quarry, the base of the 2nd lava flow is exposed and the underlying baked sediments. Apparently less is exposed here now than when Krynine was here; this is his locality 7 (1950; see Reed Gap in index). The lava shows flow breccia and other interesting features. The main face seems to show at least two flow units within the flow. You are advised not to approach the main face. The company takes no responsibility for accidents.

Return to main road and

63.2 TURN RIGHT.

63.5 Enter town of Durham. Road becomes Wallingford Road and State Highway 150. Gap in ridge held up by 2nd flow reflects a diagonal fault.

63.9 Outcrops of the 2nd flow.

65.0 Outcrops of the 3rd flow.

66.7 Center of Durham. Stop sign. TURN RIGHT on Main Street, State Highway 17.

67.6 Road forks. BEAR RIGHT with Highway 17.

67.8 Road forks. BEAR LEFT with State Highway 77.

67.9 - 68.0 STOP beside road. Outcrops of coarse conglomerate, here in Portland formation, close to eastern boundary fault. Pebbles are of crystalline rocks like those of Eastern Highlands, and also include basalt, proving that lava flowed out in the highlands as well as in the Triassic basin. Conglomerate like this occurs close to the fault throughout the Triassic basin; from here south it can be found at every stratigraphic horizon down to the upper part of the New Haven arkose, proving the contemporaneity of faulting with deposition of the Newark group.

Proceed south on Highway 77.

68.5 - 68.7 At this bend the road approaches the fault which it follows fairly closely for about 6 miles. Hills to left are schist; hills to right are mainly 3rd and 2nd lava flows (cut by several faults).

70.0 - 70.1 Outcrops of schist on right side of road and in field behind barnyard. The schist in these outcrops is chloritized and in part silicified and cut by quartz veins. All these features are common in schist close to the fault throughout Connecticut.

70.2 Enter town of Guilford.

70.6 Schist outcrop on right of road.

70.9 Schist outcrops on both sides of road. To right is Totoket Mountain, underlain by the 2nd lava flow dipping south and striking almost perpendicular to the fault.

72.1 Schist and pegmatite on left side of road; quarry in 2nd lava flow on right. In the basalt is a large mass of phyllite or fine-grained schist (considerably finer than the schist across the road), whose provenance has given rise to much debate. Possible origins are: fault slice, introduced into the basalt by shift in the course of the fault during Triassic time; overlap of lava beyond the fault; large block tumbled into lava from active fault scarp.

72.3 STOP at right of road. In this cut the eastern boundary fault is exposed, dipping 55 degrees west. The schist below it is chloritized and silicified, the basalt above it shattered. The exposure has been described by Digman (1950).

End of trip. If time permits, some may wish to see the phyllite slab in the trap at 72.1; others may wish to visit spectacular outcrops of conglomerate both below and above the 3rd lava flow, along the west shore of Lake Quonnipaug a short distance to the south (the east shore is schist and pegmatite).

Return to Hartford following Route 17 to Middletown, and either Route 3 or Routes 72 and U. S. 5. The center of Middletown can be avoided by bearing left at the first four corners beyond the intersection with Route 155 (road to Haddam); this road leads past Wesleyan University to U. S. 6A west; turn left one block, then right on Route 72. To return to Trinity, take 72 to U. S. 5, follow U. S. 5 till it swings right, there continue straight under parkway overpass to city limits of Hartford, then watch for signs pointing to Trinity. Total distance about 28 miles.